

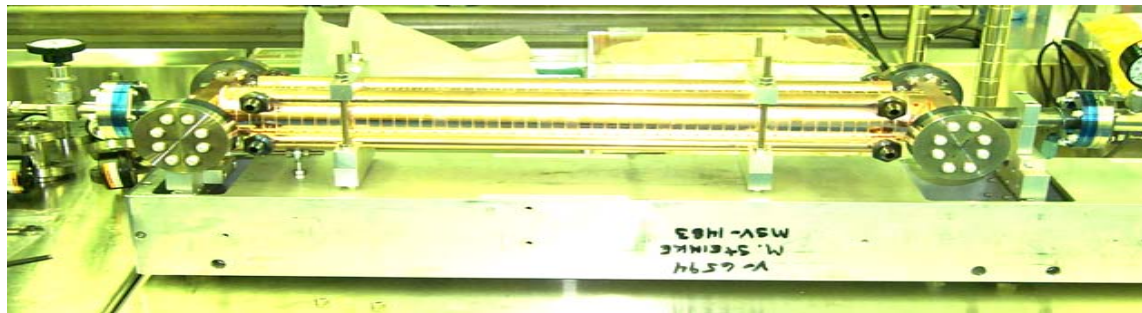
# Linear Collider at Fermilab

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Linear Collider R&D

Technical Division, Fermilab

- Warm Linear Collider R&D
- Linear Collider Directions at Fermilab FY04 and beyond



February 2 2004, All Experimenters Meeting

# Warm LC R&D at Fermilab

– **FXB:** 60 cm. Long, high phase advance (150 deg.), traveling wave structures (aka H60VG3, no slots ) were produced. (FXB001-006)

– **FXC:** 60 cm. long, 61 mm o.d. cells; 150 degree phase advance; 3% group velocity; slotted cells with  $.17 a/\lambda$ ; fully brazed construction w/o H<sub>2</sub>; Fermilab Waveguide (FWG) I/O couplers and matching cells, no HOM extraction, 4 tuning holes instead of the 2 in FXB structures. (FXC001-005)



• **FXD:** 60 cm. long, 61 mm o.d. cells; 150 degree phase advance; 4% group velocity; tapered design with slotted cells and  $.17 a/\lambda$  ; fully brazed construction w/o H<sub>2</sub>; FWG I/O couplers; I/O HOM extraction; twofold interleaving design feature. (FXD001-006)



• **FXE: Fully Fermilab Designed**

# Fermilab Structure Facilities

RF quality control clean room (Class 3000)



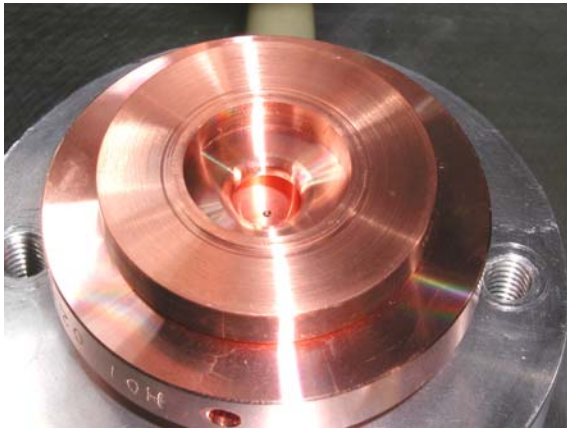
Structure assembly room (Class 1000)

Frequency  
measurement  
setup (above)  
and part  
inspection  
station  
(below)



# Fermilab RF Work

- Low Power RF Testing Development
  - Single Disk Measurement System has been improved
  - Bead Pull Measurement System techniques are continually being refined.

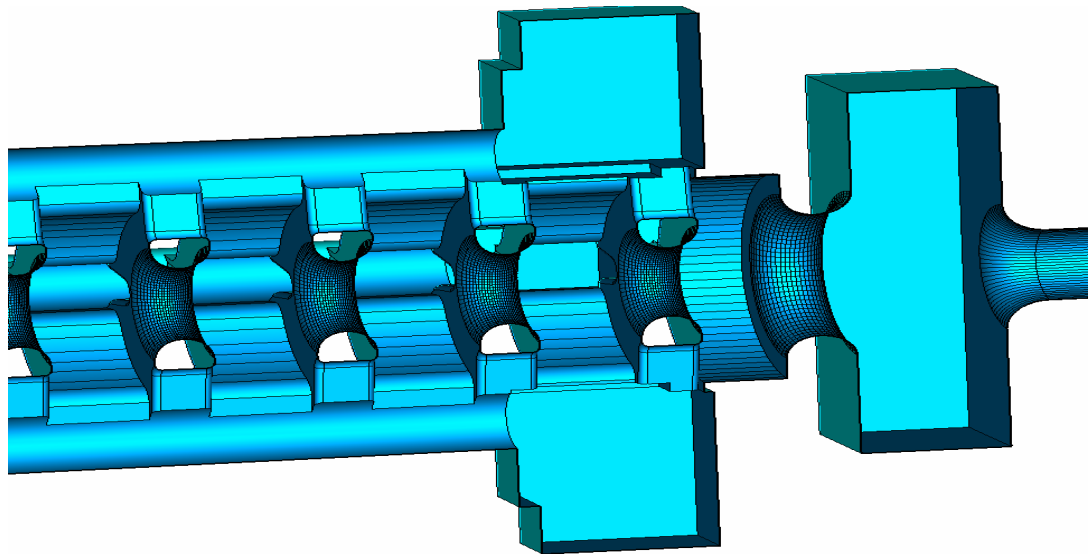


**FXB Cell on Single Disk  
RF Measurement Test  
Setup**



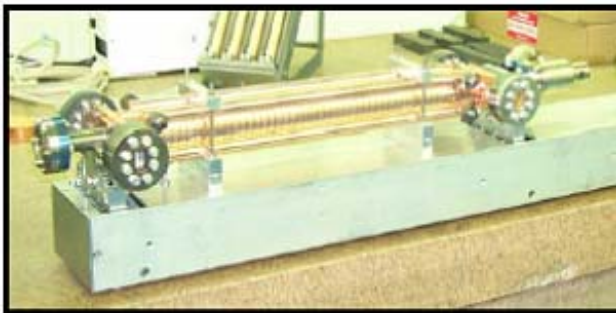
# Fermilab RF Work

- RF Design Work
  - Design of Fermilab wave guide couplers
  - Review of FXC and FXD cell tables from SLAC
  - FWG coupler and matching cells for FXC and FXD Structures
  - FXD HOM extraction design and analysis





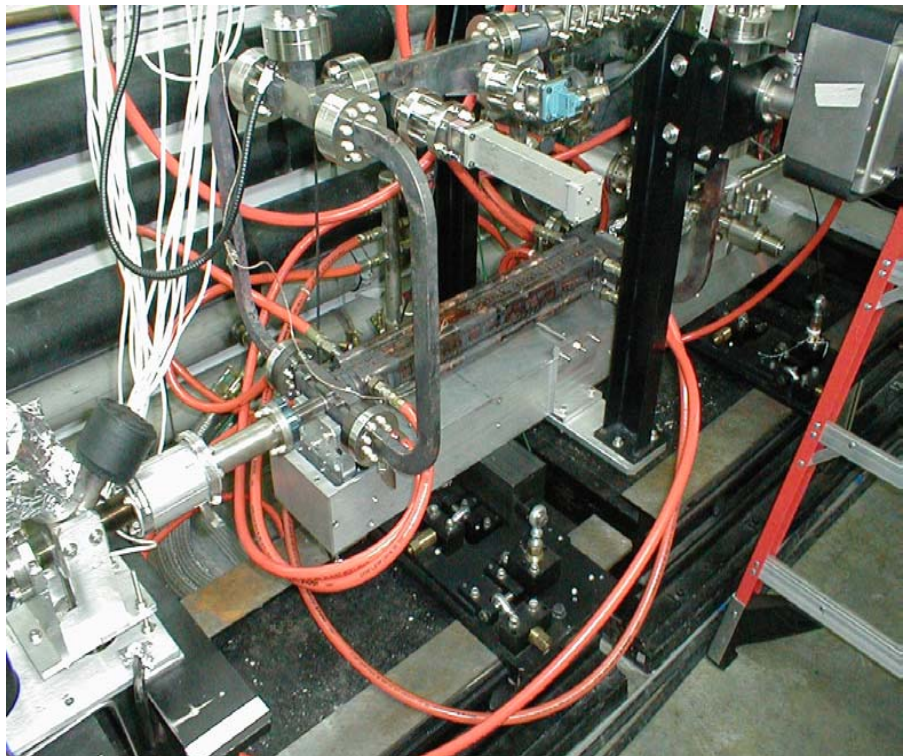
# Strongback Production



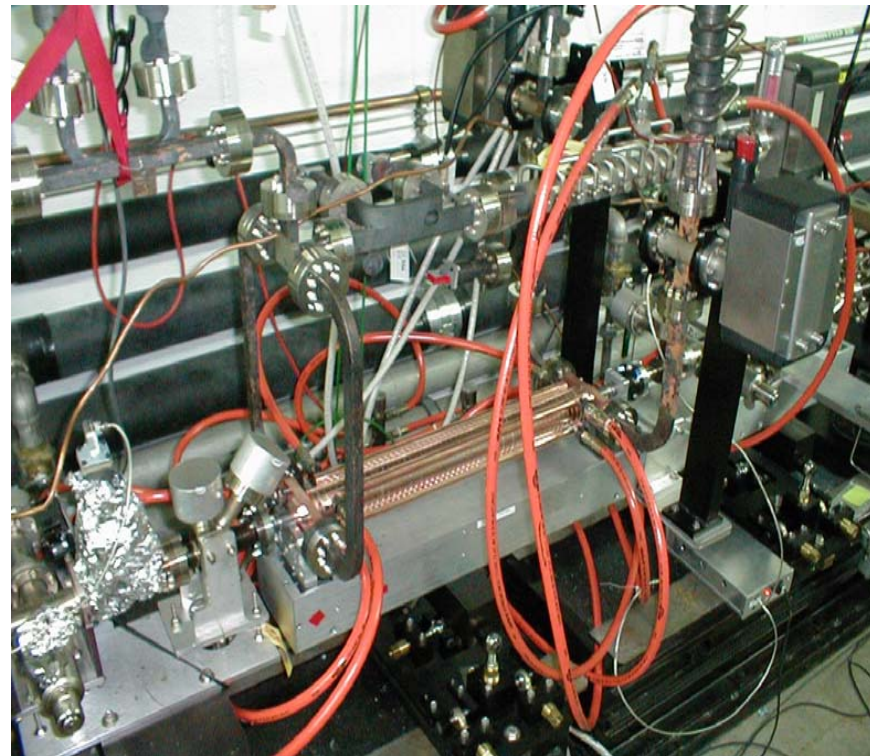
- We produced nine structure supporting systems known as “strongbacks”(six for NLCTA use at SLAC, and three for use in girder development at FNAL)

# Fermilab Structures in NLCTA

FXB006

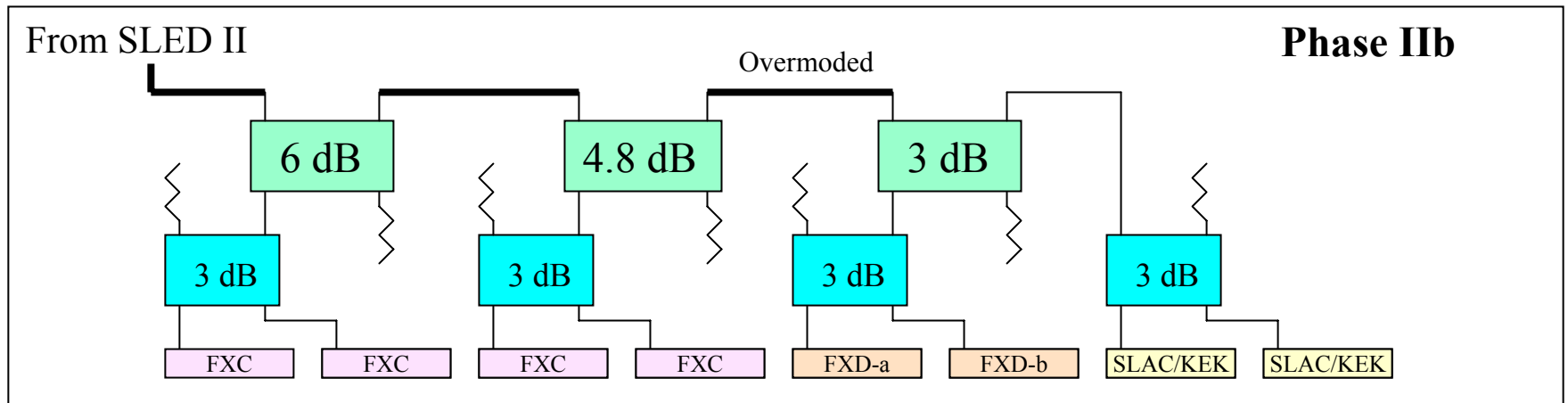
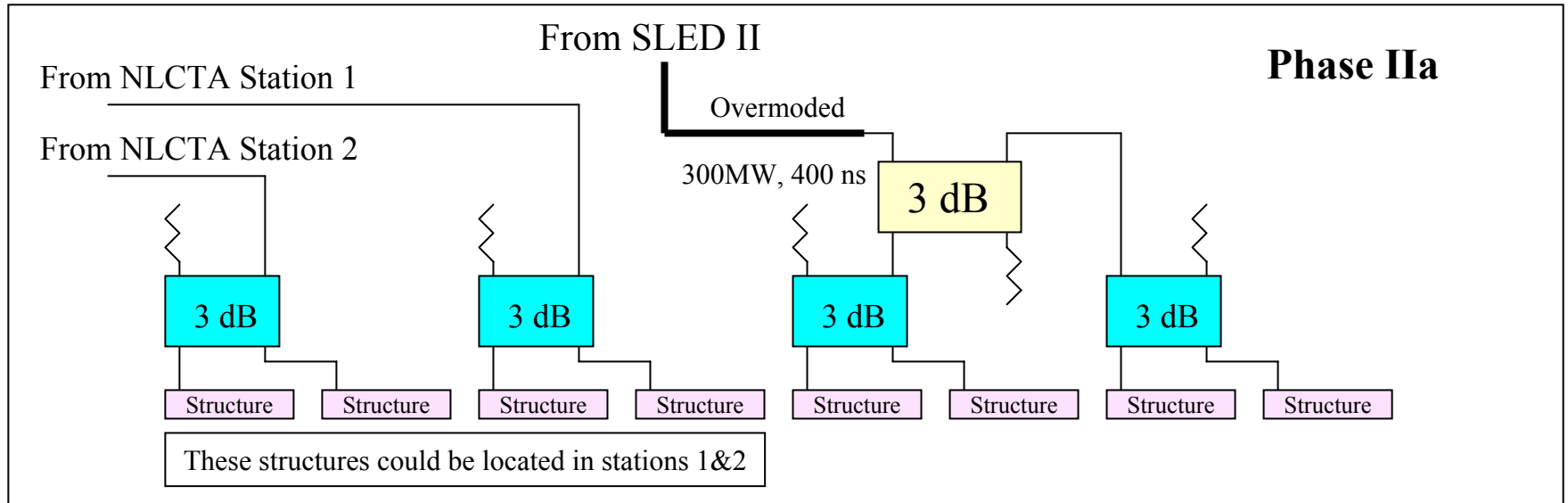


FXC001



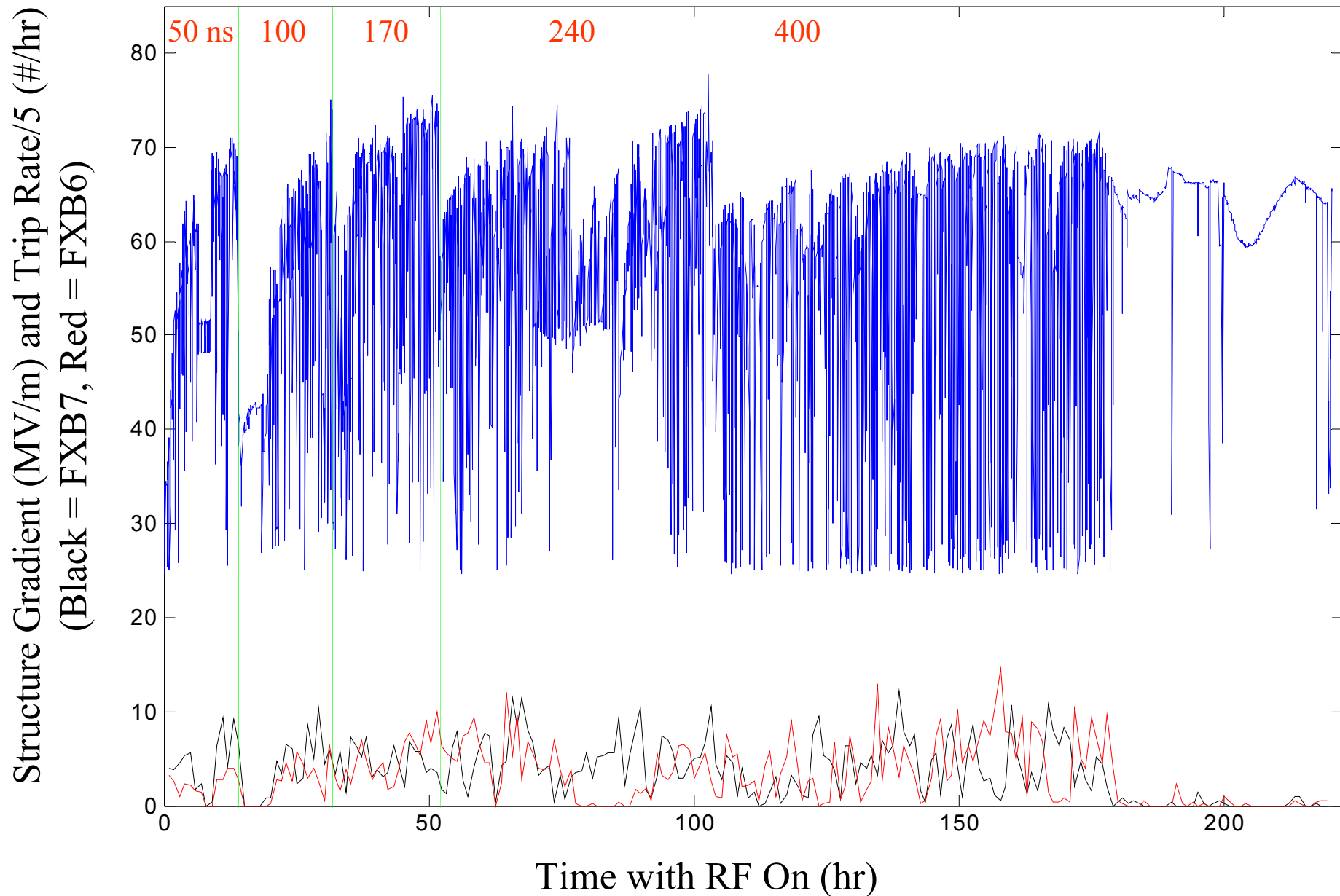
- Today there are only four Structures (FXB003,6,7 and FXC001) from Fermilab installed in NLCTA. (FXB2-7 at SLAC)
- We are shipping the FXC003 to SLAC this week. FXC004 in mid Feb.

# Eight Pack Phase 2: Power Handling Schematic



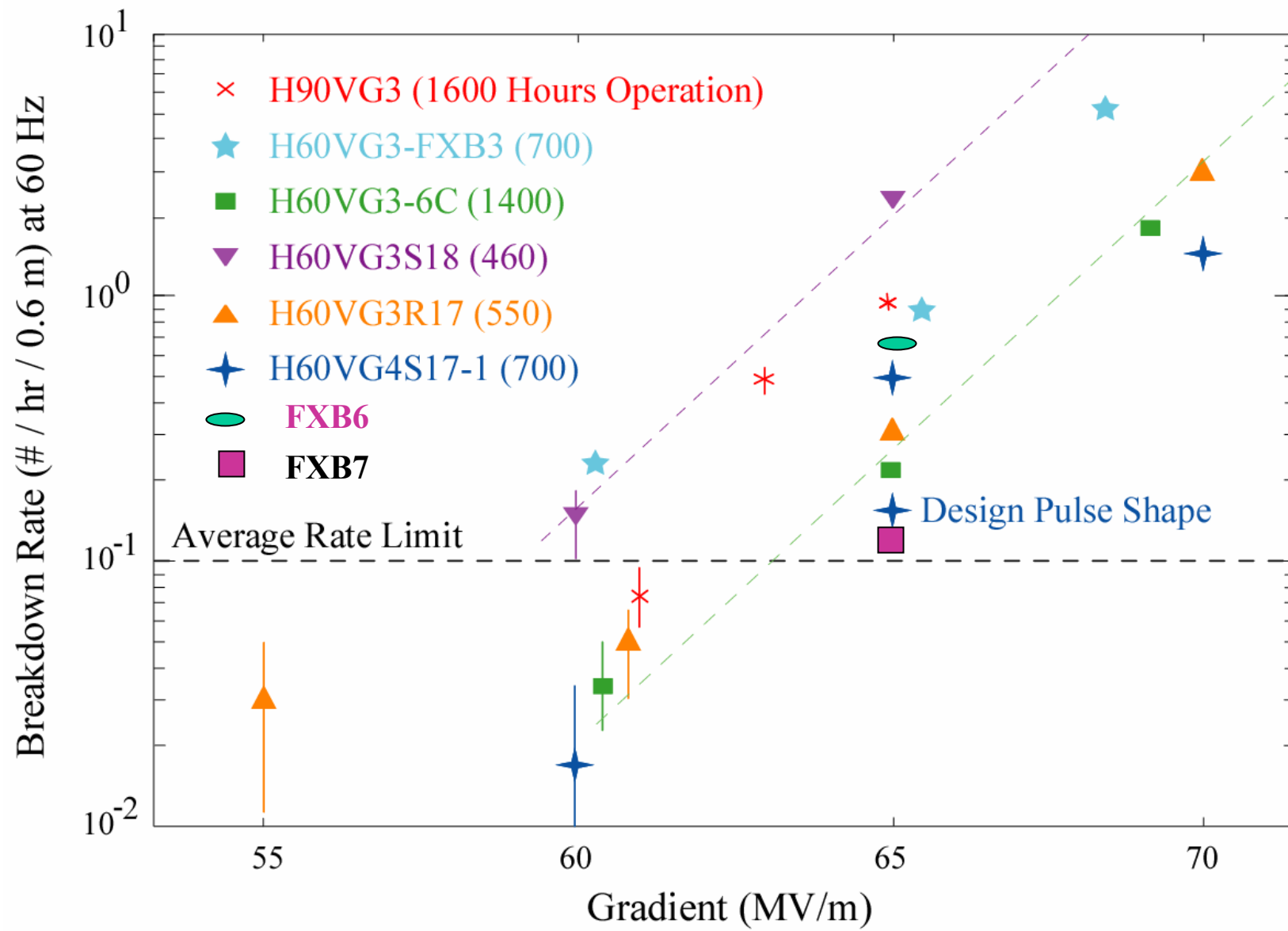


# H60VG3\_FXB6&7 Processing History

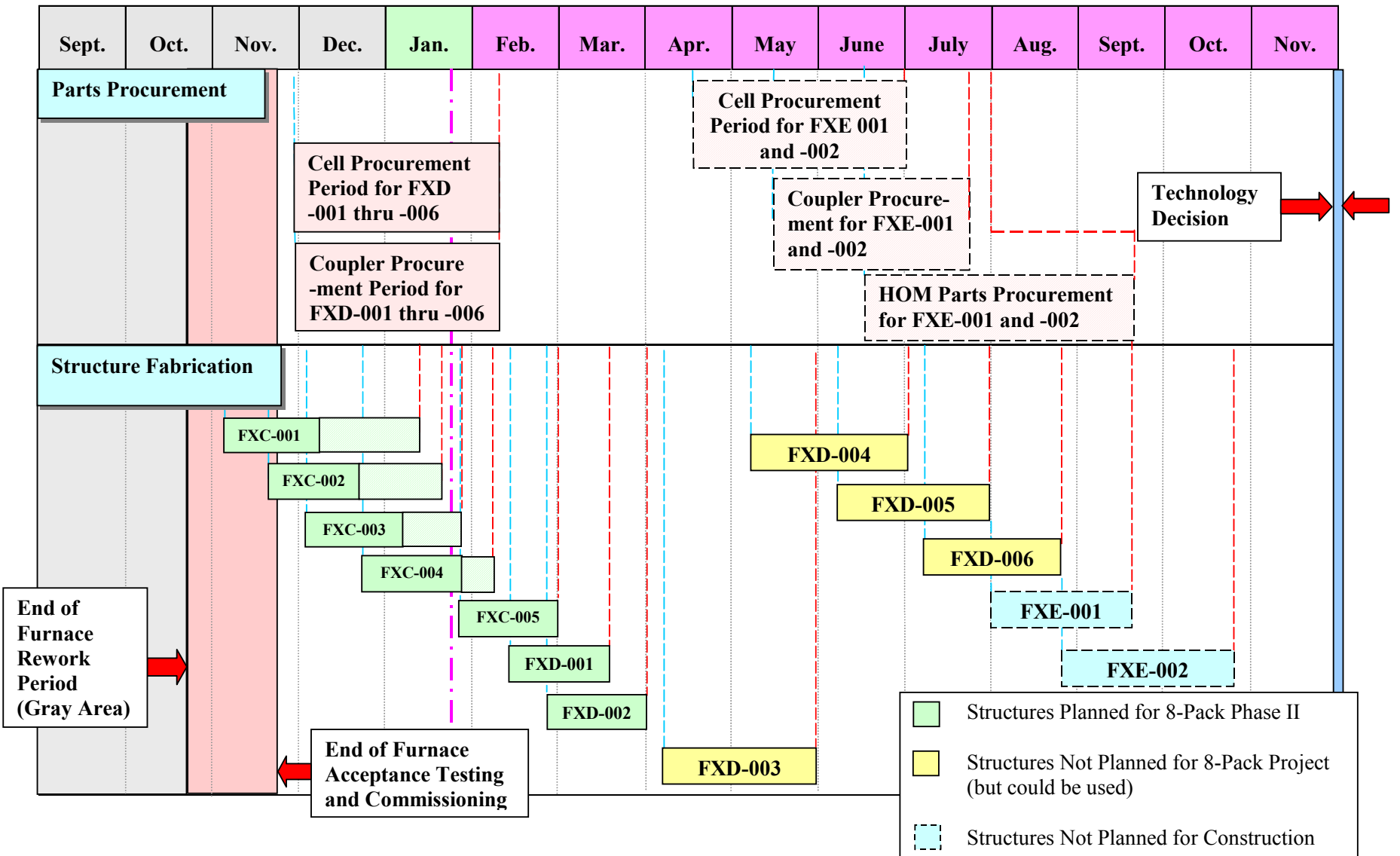


# Structure High Gradient Performance

(Breakdown Rate -vs- Unloaded Gradient with 400 ns Square Pulses)



# Warm RF Structure Plans



# Linear Collider at Fermilab FY04 and Beyond

- FLRPC is expected to endorse the Linear Collider as one of the two future accelerator efforts at Fermilab.
- We are getting ourselves organized to provide technical leadership on the LC Construction.
- We have started engaging in two accelerator physics/technology issues that are central to the Linear Collider and matches our interest and expertise. We are looking at both warm and cold design.
  - Linac
  - Damping Ring
- We are also in discussion with people in LC collaboration to take a leading role in Instrumentations, Feedback systems, Controls, Application programming.



# Linear Collider at Fermilab...

- Fermilab has proposed to take a leading role in developing proposals for a Engineering Test Facility (1% system test) for the chosen Linear Collider Technology. Fermilab is willing to serve as a host of such a facility.
- We are in process of defining
  - What should be the scope of such a facility?
  - What are the technology and physics goals for such a facility?
  - How we develop an International Collaboration to build such a facility?
  - Could the ETF be a development facility for the Instrumentation, controls, feedback systems, application program development etc.
  - Could the ETF be a development platform for one of a kind devices?
  - Could the ETF be used for industrialization and QC of major accelerator components.

# Linear Collider Group at Fermilab

- A core group of physicists and engineering staff is being assembled in the Technical division to support the planned Linear Collider effort. But a lot more is needed
- We welcome Fermilab staff to join this effort. There is a lot to be done if we want to host the Linear Collider in Illinois.
- We are working with Argonne National Laboratory to develop collaboration of accelerator physics and technologies.
- We are meeting with Universities in Illinois to collaborate with them on the Linear Collider.
- We are also discussing with Universities and other laboratories to collaborate with us on these topics.